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Art. XXIV.—*Mineral Resources of Southern India. No. 6. Lead Mines of Jungamanipenta, &c. By* Lieut. Newbold, F.R.S., &c., *Madras Army.*

(*Read June 4th,* 1842.)

I am not aware of the existence of other lead mines in Southern India than those of the Eastern Ghauts, which lie in an area bounded by the 14th and 17th degrees of N. lat., and the 78th and 80th of E. long. The principal excavations are situate near the village of Jungumrazpilly, between Cuddapah and Nellore, on the Coromandel coast.

Geognostic Position.—The lead ore runs in veins in a limestone, the age of which has not yet been satisfactorily ascertained. It is generally of different shades of grey, passing into buff, blue, and black; near the veins of ore it often becomes ferruginous, and has a brown arenaceous aspect. It is associated with sandstone, argillaceous and arenaceous slates and shales, whose age is also undetermined. These rest in unconformable stratification upon the hypogene rocks composing the base of the Eastern Ghauts.

Mining Localities.—Proceeding easterly from the table land of the Ceded Districts towards that part of the Ghaut range, termed "Nalla Malla" by the natives; after passing Nundealumpett, a small town situate in the Dhúr taluk, about nineteen miles easterly from the cantonment of Cuddapah,—the first indications of lead ore are remarked near Bussapúr,—a hamlet about 1½ koss easterly from Nundealumpett, in a knoll about 50 feet high, and about 80 yards long, by from 15 to 20 broad, which lies within 100 yards distance S.E. from the village. The base of this knoll is composed of a purplish white and green slate clay, glittering with scales of mica, having a nearly vertical laminar arrangement, and dipping E. 15 N. The sides and summit consist of a scabrous, water-worn rock, of a brown ferruginous colour, effervescing with acids, and of an earthy texture resembling that of indurated clay passing into jasper. It abounds with spherical, oval, and tubular sinuous cavities, often lined with crystals of quartz and calc spar, and sometimes filled with a reddish-brown ferro-calcareous earth. The cavities are frequently basin-shaped, resembling on a small scale the rock basins worn in river-beds. Veins of milky quartz imbedding hydrated iron ore traverse the rock; loose blocks of which lie scattered over the surface of the knoll,—mingled with nodules of a blackish grey, and greenish cellular chert,—the cavities of which are lined with a ferruginous dust. The rock is sometimes overlaid, and its fissures penetrated with compact kankar[1], imbedding fragments of the surrounding formation. The ore,—a brilliant granular galena—is usually found near the surface in the cavities just described, associated with quartz and iron ore. I had some holes dug in the rock, and succeeded in detaching a few masses containing thin veins having a dark reddish-brown exterior: many detached nodules of ore are found loose in the cavities of the rock, appearing to have been washed there; no continuous vein could be traced. From the examination of a well near the base of the knoll,—the only section that offered itself,—I found that the limestone did not form part of a continuous formation: being probably a detached hummock, or outlier of the Jungumrazpilly beds. It is situated towards the lower or southern side of a picturesque basin-shaped valley studded with tamarind groves, near the road from Cuddapah to Nellore, leading over the Dorenál pass.

Mines of Jungamanipenta, or Jungumrazpilly.

From Bussapúr the Ghauts are ascended, in a N.E. direction, by a mountain path, to numerous excavations of considerable extent, scattered along a jungly belt of undulating ground that crowns a ridge running N. and S. on both sides of the road from Cuddapah to Nellore, about four miles E. by S. from the village of Jungumrazpilly. By far the greater part of the mines lie on the ridge to the S. of the road. I counted upwards of fifty, now half-choked up with rubbish and vegetation; their sites are usually marked by mounds of stones and refuse vein stuff. In depth they vary from a few feet to an unascertained extent. Several, after descending by a vertical shaft for twenty or thirty feet, branch off into horizontal or inclined galleries: others have a gradual slope from the surface, offering convenient dens and lurking-places to the leopard, the *turrus* or *kurna*, the hyena, and other beasts of prey, whose tracks and excrement are seen around. I descended a considerable distance into one of these excavations; it was about five feet high, by as many in breadth; the roof and floor were covered with saline incrustations, mixed with mud, inclosing larvæ of insects, &c., and a coat of a greyish mould, the result partly of subterraneous damps. On the floor lay blocks and masses of excavated rock, some of which exhibited marks of blasting. After proceeding not farther than thirty paces, I was compelled to return, in consequence of the respiration becoming impeded by the mephitic state of the atmosphere, bringing with me portions of lead ore, broken from a vein in the rock, and also a fragment of the latter, showing traces of the carbonate of copper.

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[1] *Kankar*, a nodule of limestone.

Among the rubbish thrown out of a mine, whose site is marked by a *kuljuvi* tree, near the south extremity of the ridge, are numerous fragments of rock containing veins of galena, from 1 to 1½ inches thick, associated with quartz, iron ore, and disintegrating iron pyrites: spathose iron ore,—the *fer oxydé carbonaté* of the French mineralogists,—is also seen. Where veins of ore occur in the rock at a distance from the white quartz, the matrix assumes a deep reddish-brown colour, and becomes friable; but at a little distance, passes into a texture nearly as hard and close as that of jasper, with a cinnamon brown colour. It gives fire with steel; but, when reduced to a fine powder, effervesces feebly with acids. At a considerable distance from the vein it passes into the ordinary bluish-grey limestone of Cuddapah. On being struck forcibly by a hammer, it often separates in the direction of microscopic seams, the planes of which exhibit superficial dendritic appearances, which are more frequent, and better defined near the metalliferous veins.

Besides the excavations above mentioned, there are several others within the radius of five miles from this locality (at Kundéla Ború, Poleram Manú); and it is said galena is found in a hill near the Pennar, not far from Cuddapah. It is not improbable that the plumbiferous formation extends northerly towards the southern bank of the Kistna, and southerly to the Pennar.

Character of the Ore.—The ore is a granular or steel-grained galena; lustre glistening;—fracture uneven,—corresponding with the *Plomb sulfuré granulaire* of Haüy. It has been supposed to contain portions of antimony and silver. Ed. Solly, Esq., who has recently examined a specimen I brought from the Jungamanipenta excavations for the museum of the Society, thus reports upon it to the secretary. "The lead ore is a galena, or common sulphuret of lead, and the same may be said of this chromite of iron,—its value will depend on its freedom from earthy matters. A portion of the small sample sent me contained 15 per cent. of earthy matters, and 85 per cent. of sulphuret of lead. The latter contains 86 per cent. of lead."

History.—The origin of most of these extensive excavations is lost in obscurity: it is known that they existed, and were worked under the ancient Hindu kings of Bijanagur, and, subsequently, by the Mohammedan Nawabs of Cuddapah, particularly during the rule of Halim Khan, and subsequently by Hyder and Tippoo. The excavations that exhibit marks of blasting were, probably, worked by the Mussulmans, who employed gunpowder at a very early period in quarrying rocks. I was also informed by natives on the spot, that the mines were worked under the Hindu Zemindar of these districts, Comar Vencatapah Naidoo. The ancient records of the mining districts are said to have been destroyed by Tippoo. About thirty years ago, an officer of the Madras Engineers examined the mines, with a view to working them; but after a short exploration, all mining operations were given up as a losing speculation. It may be here remarked, that the lead districts I have just described, as well as other metalliferous formations of Southern India, have not hitherto met with a fair trial, conducted under favourable conditions, under the directions of, and with all the appliances of, European science and experience.